

IN THE CLAIMS:

The text of all pending claims 1-26 is set forth below. None of the claims are amended herein. The status of each claim is indicated as (original).

1. (original) A method of controlling a disc drive using a counter-electromotive force, the method comprising:

detecting a voltage applied to a voice coil during a predetermined mode;
performing an operation of the value of the counter-electromotive force using the voice coil voltage;

comparing the value of the counter-electromotive force operated with a predetermined threshold; and

when the value of the counter-electromotive force is equal to or larger than the predetermined threshold, controlling a voice coil motor and a spindle motor so that a current mode is stopped and a parking or unloading mode is executed.

2. (original) The method as claimed in claim 1, wherein the counter-electromotive force $e(t)$ is obtained by:

$$e(t) = v(t) - L \times \left(\frac{di}{dt} \right) - R \times i(t)$$

where, $v(t)$ is a voltage detected from the voice coil, L is a reactance constant of the voice coil, R is a resistance toward the voice coil from a VCM driver, and i is current applied to the voice coil.

3. (original) The method as claimed in claim 1, wherein the predetermined mode is selected among a loading mode, a seek mode, a track following mode, a read mode, and a write mode.

4. (original) The method as claimed in claim 1, wherein the predetermined threshold is calculated from a regression function corresponding to a statistical correlation between the magnitude of an external shock and the counter-electromotive force.

5. (original) A method of controlling a disc drive using a counter-electromotive force, the method comprising:

detecting a moving distance variation $\Delta Lh/\Delta t$ of a transducer with respect to a variation in time during a predetermined mode;

performing an operation of a value of the counter-electromotive force by applying the

detected moving distance variation $\Delta Lh/\Delta t$ of the transducer with respect to the variation in time to a predetermined counter-electromotive force calculation Equation;

comparing the value of the counter-electromotive force with a predetermined threshold;
and

when the value of the counter-electromotive force is equal to or larger than the predetermined threshold, controlling a voice coil motor and a spindle motor so that a current mode is stopped and a parking or unloading mode is executed.

6. (original) The method as claimed in claim 5, wherein the predetermined counter-electromotive force calculation Equation is

$$e(t) = \left(\frac{Ke}{Rh}\right) \times \left(\frac{dLh}{dt}\right),$$

where, Ke is a counter-electromotive force constant, and Rh is a distance from a pivot bearing to a transducer.

7. (original) The method as claimed in claim 5, wherein the predetermined mode is selected among a loading mode, a seek mode, a track following mode, a read mode, and a write mode.

8. (original) The method as claimed in claim 5, wherein the predetermined threshold is calculated from a regression function corresponding to a statistical correlation between the magnitude of an external shock and the counter-electromotive force.

9. (original) A disc drive, comprising:
a disc having a surface;
a spindle motor to rotate the disc;
a transducer to write and read information in and from the disc;
a voice coil motor to move the transducer; and
a controller to control the spindle motor and the voice coil motor according to a set mode, and to perform a shock damage prevention process of controlling the voice coil motor and the spindle motor, so that a current mode is stopped and a parking or unloading mode is executed if a counter-electromotive force operation process of performing an operation of a value of a counter-electromotive force using a voltage detected from the voice coil and the value of the counter-electromotive force are equal to or larger than a predetermined threshold value.

10. (original) The disc drive as claimed in claim 9, wherein the counter-electromotive

force $e(t)$ is obtained by:

$$e(t) = v(t) - L \times \left(\frac{di}{dt} \right) - R \times i(t)$$

where, $v(t)$ is a voltage detected from the voice coil, L is a reactance constant of the voice coil, and R is a resistance toward the voice coil from a VCM driver, and i is current applied to the voice coil.

11. (original) The disc drive as claimed in claim 9, wherein the predetermined mode is selected among a loading mode, a seek mode, a track following mode, a read mode, and a write mode.

12. (original) The disc drive as claimed in claim 9, wherein the predetermined threshold is calculated from a regression function corresponding to a statistical correlation between the magnitude of an external shock and the counter-electromotive force.

13. (original) The disc drive as claimed in claim 9, wherein the controller further comprises:

a circuit to compensate signal delay between a driving signal to drive the voice coil motor and a voltage detection signal from the voice coil.

14. (original) A disc drive, comprising:

a disc having a surface;

a spindle motor to rotate the disc;

a transducer to write and read information in and from the disc;

a voice coil motor to move the transducer; and

a controller to control the spindle motor and the voice coil motor according to a set mode, and using a moving distance variation $\Delta Lh/\Delta t$ of the transducer with respect to a variation in time detected during the set mode Δt , to perform a shock damage prevention process of controlling the voice coil motor and the spindle motor, so that a current mode is stopped and a parking or unloading mode is executed if a counter-electromotive force operation process of performing an operation of the value of a counter-electromotive force using a predetermined counter-electromotive force calculation Equation and the value of the counter-electromotive force of which operation is performed in the counter-electromotive force operation process are equal to or larger than a predetermined threshold value.

15. (original) The disc drive as claimed in claim 14, wherein the predetermined counter-

electromotive force calculation Equation is

$$e(t) = \left(\frac{Ke}{Rh}\right) \times \left(\frac{dLh}{dt}\right),$$

where, Ke is a counter-electromotive force constant, and Rh is a distance from a pivot bearing to the transducer.

16. (original) The disc drive as claimed in claim 14, wherein the predetermined mode is selected among a loading mode, a seek mode, a track following mode, a read mode, and a write mode.

17. (original) The disc drive as claimed in claim 14, wherein the predetermined threshold is calculated from a regression function corresponding to a statistical correlation between the magnitude of an external shock and the counter-electromotive force.

18. (original) A computer readable storage storing at least one program to control a disc drive using a counter-electromotive force according to a process comprising:

detecting a voltage applied to a voice coil during a predetermined mode;

performing an operation of the value of the counter-electromotive force using the voice coil voltage;

comparing the value of the counter-electromotive force operated with a predetermined threshold; and

when the value of the counter-electromotive force is equal to or larger than the predetermined threshold, controlling a voice coil motor and a spindle motor so that a current mode is stopped and a parking or unloading mode is executed.

19. (original) The computer readable storage as claimed in claim 18, wherein the counter-electromotive force $e(t)$ is obtained by:

$$e(t) = v(t) - L \times \left(\frac{di}{dt}\right) - R \times i(t)$$

where, $v(t)$ is a voltage detected from the voice coil, L is a reactance constant of the voice coil, R is a resistance toward the voice coil from a VCM driver, and i is current applied to the voice coil.

20. (original) The computer readable storage as claimed in claim 18, wherein the predetermined mode is selected among a loading mode, a seek mode, a track following mode, a read mode, and a write mode.

21. (original) The computer readable storage as claimed in claim 18, wherein the predetermined threshold is calculated from a regression function corresponding to a statistical correlation between the magnitude of an external shock and the counter-electromotive force.

22. (original) A computer readable storage storing at least one program to control a disc drive using a counter-electromotive force according to a process comprising:

detecting a moving distance variation $\Delta Lh/\Delta t$ of a transducer with respect to a variation in time during a predetermined mode;

performing an operation of a value of the counter-electromotive force by applying the detected moving distance variation $\Delta Lh/\Delta t$ of the transducer with respect to the variation in time to a predetermined counter-electromotive force calculation Equation;

comparing the value of the counter-electromotive force with a predetermined threshold; and

when the value of the counter-electromotive force is equal to or larger than the predetermined threshold, controlling a voice coil motor and a spindle motor so that a current mode is stopped and a parking or unloading mode is executed.

23. (original) The computer readable storage as claimed in claim 22, wherein the predetermined counter-electromotive force calculation Equation is

$$e(t) = \left(\frac{Ke}{Rh}\right) \times \left(\frac{dLh}{dt}\right),$$

where, Ke is a counter-electromotive force constant, and Rh is a distance from a pivot bearing to a transducer.

24. (original) The computer readable storage as claimed in claim 22, wherein the predetermined mode includes a loading mode, a seek mode, a track following mode, a read mode, and a write mode.

25. (original) The computer readable storage as claimed in claim 22, wherein the predetermined threshold is calculated from a regression function corresponding to a statistical correlation between the magnitude of an external shock and the counter-electromotive force.

26. (original) A method of controlling a disc drive having a transducer and a disc by using a counter-electromotive force, the method comprising:

calculating the counter-electromotive force using a voice coil voltage or a position error

signal without installing an additional shock sensor to sense disturbance in the disc drive;
determining a magnitude of an external shock or a magnitude of vibration by the
calculated counter-electromotive force; and

when the magnitude of an external shock or the magnitude of vibration determined by the
counter-electromotive force exceeds a tolerance range of the disc drive, controlling the disc drive
so that a current mode is automatically converted into a parking or unloading mode, preventing
malfunctions of the disc drive due to collisions between the transducer and the disc.